REMARKS

The Office Action dated July 16, 2002 has been fully considered. Claims 1-49 are pending in this application, of which claims 1, 12, 25, 36 and 47 have been amended. Reconsideration of the claims is respectfully requested.

In paragraph 3 on page 2 of the Office Action, claims 1-11 and 36-49 are rejected under 35 U.S.C. § 102(b) as being clearly anticipated by U.S. Patent 5,854,757 issued to Dierke.

In paragraph 4 on page 3 of the Office Action, claims 12-35 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Dierke.

In paragraph 5 on page 3 of the Office Action, claims 1-49 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent 5,701,263 issued to Pineda in view of U.S. Patent 5,781,239 issued to Mattela et al (hereinafter Mattela).

The Applicants respectfully traverse the rejection for the following reasons.

Applicants' invention, as recited in amended claims 1, 12, 25, 36 and 47, requires arranging discrete cosine transform equations into at least one collection of at least two discrete transform equations, wherein the collection includes at least two discrete cosine transform constants, scaling the discrete cosine transform equations in the at least one collection by dividing each of the discrete cosine transform constants in the collection by one of the discrete cosine transform constants from the at least one collection and representing each of the scaled discrete cosine transform constants with sums of powers-of-2 that are approximations for the scaled discrete cosine transform constants.

In contrast, Dierke discloses an inverse discrete cosine transform processor. Dierke discloses scaling a matrix representing inverse discrete cosine transform equations with a scaling matrix such that each row in the matrix is scaled by a term that causes many coefficients in the matrix to become equal to 1. The resulting scaled matrix is then partitioned so that a "butterfly" operation may be performed on the even and odd sums to produce pairs of transformed elements simultaneously.

However, Dierke fails to suggest arranging discrete cosine transform equations into at least one collection of at least two discrete transform equations, wherein the collection includes at least two discrete cosine transform constants. Dierke merely scales each row in the matrix. The matrix is only arranged in rows as is a standard matrix algebra format. Dierke does not even recognize the possibility of dividing the matrix into a collection of at least two discrete transform equations that can then be scaled separately from the other collections. Further, Dierke fails to suggest scaling the discrete cosine transform equations in the at least one collection by dividing each of the discrete cosine transform constants in the collection by one of the discrete cosine transform constants from the at least one collection. Rather, Dierke scales each row separately.

Dierke also fails to represent each of the scaled discrete cosine transform constants with sums of powers-of-2 that are approximations for the scaled discrete cosine transform constants. While Dierke recognizes that multiplication may be performed on binary represented number by performing shift operations, Dierke does not suggest representing each of the scaled discrete cosine transform constants with sums of powers-of-2.

Therefore, Applicants respectfully submit that claims 1, 12, 25, 36 and 47, as amended, are patentable over Dierke.

Pineda fails to remedy the deficiencies of Dierke. Pineda teaches that each coefficient in the coefficient matrix is multiplied by the prescaling coefficient from equation (7) that corresponds to its position in the matrix. In other words, the scaling coefficient as taught by Pineda changes depending upon the position of the coefficient in the coefficient matrix. See Col. 6, lines 6-9. Therefore, Pineda fails to suggest arranging discrete cosine transform equations into at least one collection of at least two discrete transform equations, wherein the collection includes at least two discrete cosine transform constants. Pineda, like Dierke, does not even recognize the possibility of dividing the matrix into a collection of at least two discrete transform equations that can then be scaled separately from the other collections. Further, Pineda fails to suggest scaling the discrete cosine transform equations in the at least one collection by dividing each of the discrete cosine transform constants in the collection by one of the discrete cosine transform constants from the at least one collection. Rather, Pineda prescales each input value followed by multiplication of the result with a matrix specially chosen so that the product will represent the IDCT of the input data. Pineda also fails to represent each of the scaled discrete cosine transform constants with sums of powers-of-2 that are approximations for the scaled discrete cosine transform constants.

Therefore, Applicants respectfully submit that claims 1, 12, 25, 36 and 47, as amended, are patentable over Dierke and Pineda.

Mattela fails to remedy the deficiencies of Dierke and Pineda. Mattela fails to suggest the use of a single coefficient from the collection of coefficients for using in

scaling the equations in a collection of discrete cosine equations. Rather, Mattela produces a scaling vector of size 10 which is required to scale the input coefficient matrix F_{uv}, where the particular value of the scaling parameter is selected from the scaling vector based upon the row/column position of the input coefficient matrix F_{uv}. See Col. 12, lines 16-49, in conjunction with FIG. 11. Mattela also fails to recognize the possibility of dividing the matrix into a collection of at least two discrete transform equations that can then be scaled separately from the other collections of the matrix.

Mattela also fails to represent each of the scaled discrete cosine transform constants with sums of powers-of-2 that are approximations for the scaled discrete cosine transform constants. Rather, Mattela performs the inverse DCT based on the Chen algorithm for IDCT computation. According to the Chen algorithm, the transform matrix I is calculated using a Q matrix and a P matrix. The Q matrix is a diagonal matrix which has diagonal non-zero values, with the remainder of the values being 0. The P matrix includes a plurality of values which are the opposite sign of each other. The coefficients in the P matrix are represented by bits, but are not represented by sums of powers-of-2 that are approximations for the scaled discrete cosine transform constants. Rather, the P matrix constants are in fact unscaled constants. Further, the P matrix constants values are not approximations for the scaled discrete cosine transform constants.

Therefore, Applicants respectfully submit that claims 1, 12, 25, 36 and 47, as amended, are patentable over Dierke, Pineda and Mattela.

Because claims 2-11, 13-24, 26-35, 37-46, and 48-49, which depend directly or indirectly from claim 1, 12, 25, 36 and 47 respectively, and include the features recited

in the independent claims as well as additional features, Applicant respectfully submits that claims 2-11, 13-24, 26-35, 37-46, and 48-49 are also patentably distinct over the cited references. Nevertheless, Applicants are not conceding the correctness of the Office Action's rejection with respect to such dependent claims and reserve the right to make additional arguments if necessary.

In view of the amendments and reasons provided above, it is believed that all pending claims are in condition for allowance. The amendments clarify the patentable invention without adding new subject matter. Applicant respectfully requests favorable reconsideration and early allowance of all pending claims.

If a telephone conference would be helpful in resolving any issues concerning this communication, please contact Attorney for Applicants, David W. Lynch, at 952-253-4104.

Respectfully submitted,

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PATENT TRADEMARK OFFICE

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Appendix A

1. (Amended) A method for generating faster discrete cosine transforms, comprising:

arranging discrete cosine transform equations into at least one collection of at least two discrete transform equations, wherein the collection includes [having] at least two discrete cosine transform constants;

scaling the discrete cosine transform equations in the at least one collection by dividing each of the discrete cosine transform constants in the collection by one of the discrete cosine transform constants from the at least one collection; and

representing each of the scaled discrete cosine transform constants with sums of powers-of-2 that are approximations for the [estimated] scaled discrete cosine transform constants [approximated by sums of powers-of-2].

12. (Amended) A data compression system, the data compression system comprising a discrete cosine transformer for applying a discrete cosine transform to decorrelate data into discrete cosine transform equations, the discrete cosine transform equations having been formed by arranging the discrete cosine transform equations into at least one collection of at least two discrete transform equations, wherein the collection includes [having] at least two discrete cosine transform constants, scaling the discrete cosine transform equations in the at least one collection by dividing each of the discrete cosine transform [constant] constants in the collection by one of the discrete cosine transform constants from the at least one collection and representing each of the scaled discrete cosine transform constants with sums of powers-of-2 that are approximations for the [estimated] scaled discrete cosine transform constants [approximated by sums of powers-of-2].

25. (Amended) A printer, comprising:

a memory for storing data;

a processor for processing the data to provide a compressed print stream output; and

a printhead driving circuit for controlling a printhead to generate a printout of the data;

wherein the processor applies a discrete cosine transform to decorrelate data into transform coefficients using discrete cosine equations, the discrete cosine transform equations having been formed by arranging the discrete cosine transform equations into at least one collection of at least two discrete transform equations, wherein the collection includes [having] at least two discrete cosine transform constants, scaling the discrete cosine transform equations in the at least one collection by dividing each of the discrete cosine transform [constant] constants in the collection by one of the discrete cosine transform constants from the at least one collection and representing each of the scaled discrete cosine transform constants with sums of powers-of-2 that are approximations for the [estimated] scaled discrete cosine transform constants [approximated by sums of powers-of-2].

36. (Amended) An article of manufacture comprising a program storage medium readable by a computer, the medium tangibly embodying one or more programs of instructions executable by the computer to use equations created by a method for generating faster discrete cosine transforms, the method comprising:

arranging discrete cosine transform equations into at least one collection of at least two discrete transform equations, wherein the collection includes [having] at least two discrete cosine transform constants;

scaling the discrete cosine transform equations in the at least one collection by dividing each of the discrete cosine transform [constant] constants in the collection by one of the discrete cosine transform constants from the at least one collection; and

representing each of the scaled discrete cosine transform constants with sums of powers-of-2 that are approximations for the [estimated] scaled discrete cosine transform constants [approximated by sums of powers-of-2].

47. (Amended Twice) A data analysis system, comprising;

a memory for storing discrete cosine transform equations having been formed by arranging discrete cosine transform equations into at least one collection of at least two discrete transform equations, wherein the collection includes [having] at least two discrete cosine transform constants, scaling the discrete cosine transform equations in the at least one collection by dividing each of the discrete cosine transform constants in the collection by one of the discrete cosine transform constants from the at least one collection and representing each of the scaled discrete cosine transform constants with sums of powers-of-2 that are approximations for the [estimated] scaled discrete cosine transform constants [approximated by sums of powers-of-2]; and

a transformer for applying the transform equations to perform a discrete cosine transform to decorrelate data into discrete cosine transform coefficients.